

PATENT COOPERATION TREATY

PCT

REC'D 31 JAN 2005

INTERNATIONAL PRELIMINARY EXAMINATION REPORT PCT (PCT Article 36 and Rule 70)

Applicant's or agent's file reference P18966PC00	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO2004/000072	International filing date (<i>day/month/year</i>) 18.03.2004	Priority date (<i>day/month/year</i>) 26.03.2003
International Patent Classification (IPC) or both national classification and IPC E04C3/00		
Applicant		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11.11.2004	Date of completion of this report 28.01.2005
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized Officer Cleuziou, Y Telephone No. +49 89 2399-2492



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/NO2004/000072**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-3 received on 11.11.2004 with letter of 10.11.2004

Claims, Numbers

1-10 received on 11.11.2004 with letter of 10.11.2004

Drawings, Sheets

1/2-2/2 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/NO2004/000072**

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-10
	No: Claims	
Inventive step (IS)	Yes: Claims	1-10
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement :

1. An amendment filed with the letter dated 10.11.2004 introduce subject-matter which extends beyond the content of the application as filed, contrary to Rule 70.2(c) PCT. The amendment concerned is the following:

- page 1, line 31: The two separate chains of pipe sections are **flexible** prior to be assembled and
- claim 1 (page 4, lines 6, 9 and 16) and claim 8 (page 5, lines 14 and 16): **flexible** pipes-half(ves).

Moreover, in claim 1 (page 4, line 10), the same pipes-half(ves) are qualified as being "rigid", which appears to be contradictory to their flexibility.

In fact, it seems that the pipes-half(ves) are articulated by means of hinges, which does automatically mean that they are flexible as the bands mentioned in the cited prior art.

Consequently, the present report is established as if the expression "flexible pipes-half(ves)" was not introduced in the application.

2. Reference is made to the following document:

D1: SE 459 267 B

- 2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1 and shows (the whole document and in particular the figures) a rigid pipe of variable length comprising the features of claim 1 described at page 4, lines 5-9 and 12-17.

The subject-matter of claim 1 differs from the rigid pipe of variable length known from D1 in that each elongated pipe-half is formed as a chain of rigid, semi-cylindrical pipe sections (2) joined together in series at their opposing transversal ends by hinges (3).

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

- 2.2. The problem to be solved by the present invention may be regarded as having a more rigid pipe capable to support higher loads.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) because D1 and the other cited documents use continuous flexible bands to carry out the pipe in a zipper-like motion and the cited prior art does not suggest the use of articulated pipe sections to form a pipe of variable length in this way.

3. Claim 8 which concerns the method for forming a rigid pipe according to claim 1 is also new and inventive.

Claims 2-7 and 9-10 are respectively dependent on product claim 1 and method claim 8 and as such also meet/s the requirements of the PCT with respect to novelty and inventive step.

HINGED AND SEGMENTED PIPE

TECHNICAL FIELD

5 The present invention relates to a rigid pipe comprised of hinged and segmented semi-cylindrical pipe sections that are sequentially joined together to form a rigid pipe having a long stroke-length that can be used in machines, tools, constructions or as an independent unit.

10 BACKGROUND ART

The prior art comprises solutions such as cylinders, telescopic cylinders, rack-and-pinion-devices, threaded poles, manipulators, scissor-actuated lifts, coiled pipes, or combinations thereof.

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From US patent number 6 283 203 is known a device for drilling oil wells. This device comprises two rack-and-pinion elements having an H-profile in a guide that among other things raises and lowers a pipe in a drilling tower.

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From SE 459 267 is known an elongated cylindrical sleeve comprised of two flexible, semi-cylindrical bands that are wound on spools, and sequentially joined together to form the sleeve. This sleeve however does not form a rigid cylindrical pipe of sufficient structural integrity to be used in industrial settings.

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DISCLOSURE OF THE INVENTION

The present invention provides a rigid pipe that can be formed of desired length. The pipe is comprised of two chains of semi-cylindrical pipe sections joined by
30 hinges, that are sequentially locked together to form the rigid pipe. Because the two separate chains of pipe sections are flexible prior to being assembled, the chains may be stored on spools in a housing prior to assembly, thus achieving considerable economy of space, among other advantages that will be apparent to one skilled in the art.

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Several advantages of the invention in relation to the prior art are:

Longer stroke-length, more compact. Smaller dimensions when assembled.

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Simpler design, less expensive, faster to produce, less expensive spare parts,

Adapted for the mounting of various tools at the end of the pipe.

Simple drive unit that does not require large amounts of hydraulic fluid.

Large capacity (power) and speed

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The invention will be described in detail with reference to the following figures, wherein,

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Fig 1 shows both a perspective view of the rigid pipe and housing, and a detailed view of one embodiment the rigid pipe having threads on its outside surface.

Fig 2 shows two detailed views of the hinge and locking means

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Fig 3 shows cross sectional view of the pipe sections wound in a housing

Fig 4 detailed view of pipe sections being joined together in a guide, and a cross section of tw joined pipe sections

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A rigid pipe of varying length (1) is achieved according to the invention in that half-cylinder shaped elements (2) are hinged (3) to each other and in that the concave sides of two of such chains are connected together in a zipper-like motion. The term "zipper-like motion" is implicitly understood to mean that opposing half-cylinder shaped elements are sequentially joined together to form a rigid pipe of

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The two half-cylindrical chains are rolled up on the each side of the pipe.

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In a zipper-like motion, the opposing half-cylindrical elements (2) are locked (4) to each other with the object of preventing the pipe from coming apart / becoming deformed under a load. The term "zipper-like motion" further implies that the locking means (4) from one cylindrical element (2) is complimentary to the locking means (4) from the opposing cylindrical element (2) to which it is attached.

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The pipe elements are rolled (13) together in a housing (12) comprising a spool arrangement (5) and a guide (6) that leads the two halves together. In addition, the housing comprises a drive unit (7) that maneuvers the assembled pipe (1) out and in.

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The drive unit (7) can function using a threaded pipe-, rack-and-pinion-, active spooling-, or friction principle. With the last-mentioned type, the elements can have a smooth surface. The drive unit will thus function in a similar manner as for a coiled pipe. In the case of a threaded pipe (8) and rack-and-pinion systems, the

elements must have threads or teeth respectively. One can envision an active spool arrangement (5) that drives the pipe (1) out.

5 The purpose of the guide (6) is to lead the two halves together or apart from each other and to prevent rotation of the pipe.

The half-cylindrical elements (2) can be reinforced with internal cross walls (10) and longitudinal ribs (11) to increase in the mechanical strength of the connected pipe (1).

PATENT CLAIMS

- 5 1. A rigid pipe of variable length (1), comprising a first elongated, flexible pipe-half joined to an opposing second elongated, flexible pipe-half, said elongated pipe-halves being individually wound on spools (5) in a housing (12) and are progressively connected to each other to form a pipe (1) of desired length, characterized in that each elongated, flexible pipe-half is formed as a chain of rigid, semi-cylindrical pipe sections (2) joined together in series at their opposing ends by hinges (3), and further characterized in that each rigid pipe section (2) from the first elongated pipe-half comprises a locking means (4) that is complimentary to a locking means (4) on the opposing rigid pipe section (2) from the second elongated pipe-half, such that the complimentary locking means lock the flexible pipe-halves together with their concave side directed towards each other forming an elongated rigid pipe of desired length.
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- 20 2. A rigid pipe according to claim 1, characterized in that each rigid pipe section (2) comprises internal cross-walls (10) and/or longitudinal ribs (11) for increasing the rigidity of the pipe.
- 25 3. A rigid pipe according to claim 2, characterized in that the rigid pipe sections (2) are brought into opposing alignment with each other by the help of a guide member (6), and that each rigid pipe section (2) has a groove (9) on its convex outer surface that engages a portion of guide member (6) to prevent rotation of the pipe sections.
- 30 4. A rigid pipe according to claim 3, characterized in that the rigid pipe sections are brought progressively together by the help of a drive unit (7) that actively drives the rigid pipe sections out of housing (12).

5. A rigid pipe according to claim 4, characterized in that the convex outer surface of the rigid pipe sections (2) comprises threads (6) that engage corresponding threads of drive unit (7).
- 5 - 6. A rigid pipe according to claim 4, characterized in that the convex outer surface of the rigid pipe sections (2) comprises teeth that engage corresponding teeth of drive unit (7).
- 10 7. A rigid pipe according to claim 4, characterized in that the convex outer surface of the rigid pipe sections (2) is smooth, and engages corresponding smooth rollers of drive unit (7) by friction.
- 15 8. A method for forming a rigid pipe (1) of variable length from two elongated, flexible pipe-halves, characterized by comprising the steps of:
- forming each of the two elongated, flexible pipe-halves by connecting a plurality of rigid, semi-cylindrical pipe sections (2) together in a chain by hinged connections (3) between opposing ends of the rigid sections (2);
 - 20 - arranging each chain of rigid pipe sections (2) on a separate spool (5) in a housing (12) of a connection device, the connection device further comprising a guide member (6) and a drive unit (7);
 - bringing the elongated pipe-halves together in a progressive manner such that the concave sides of each pipe section is successively arranged facing the concave side of an opposing pipe section;
 - 25 - equipping each rigid pipe section (2) with a locking means (4) that is complimentary to a locking means (4) on its opposing pipe section;
 - Pressing the opposing pipe sections together such that they lock together; and
 - 30 - Continuously feeding pipe sections from the connection device until a rigid pipe of desired length is obtained.

9. The method according to claim 8, characterized in the the outer convex surface of the rigid pipe sections (2) is smooth, and engages a plurality of smooth rollers of drive unit 7 by friction.

5 10. The method according to claim 8, characterized in the the outer convex surface of the rigid pipe sections (2) has threads (6) or teeth that engages corresponding threads or teeth on a plurality of rollers of drive unit (7).